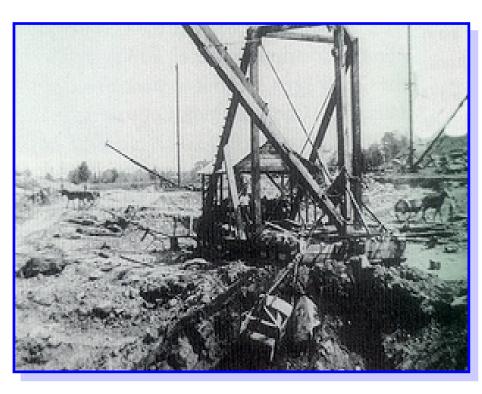
Surface Mining...





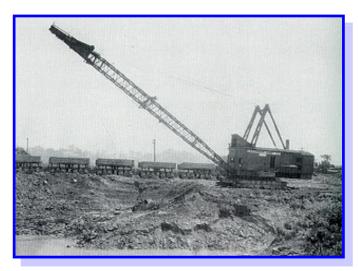
... Dragline Methods

History of Draglines



- ✓ First dragline built in 1904 by Page & Schnable
- ✔ Built for a specific need on the Chicago Drainage Canal project
- ✓ In 1912, Page Engineering Company incorporated when Page discovered building draglines more profitable than contracting







- ✓ Up until 1912 no one had developed a means of propelling the machine
- ✓ In 1913 an engineer for Monighan Machine
 Company revolutionized dragline by placing two shoes, one on each side of the revolving frame
- ✓ The Model 1-T became the first walking dragline



World's Largest Machines

- ✓ 1935 12 CY manufactured by Bucyrus Erie
- ✓ 1942 30 CY manufactured by Marion
- ✓ 1961 40CY manufactured by Ransom & Rapier (British)
- ✓ 1963 85 CY manufactured by Marion
- ✓ 1965 145 CY manufactured by Marion
- ✓ 1969 220 CY manufactured by Bucyrus Erie



World's Largest Machines



BIG MUSKIE

- Muskinghum Mine of Central Ohio Coal Company (AEP)
- ✓ Operated until June 1991
- Attempting to preserve as a public historical facility

✓ Today only two remaining manufactures of draglines:

- Bucyrus Erie
- P & H







History of Dragline Operations in West Virginia

- ✓ Joe Hughes of Northeast Mining Company operated a 4 yard Page near Beaver Creek in Tucker County in 1963
- ✓ During late 1960's and 1970's several operations including:

Imperial Coal & Construction Co.

Grant County Coal Corp.

Byron Construction Company

Bitner Mining

Island Creek Coal



History of Dragline Operations in West Virginia

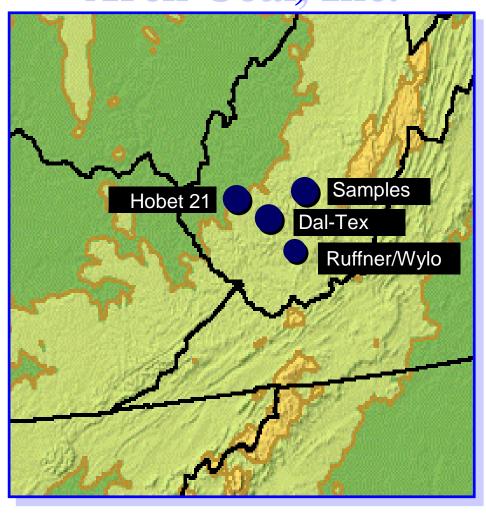
- ✓ 1983 Hobet Mining began operations with a BE 1570 80 CY dragline at Hobet 21 near Madison
- ✓ 1983 Taywood Mining operated a Marion 183M 9 CY
- ✓ 1987 Hobet Mining installed Marion 8200 72 CY machine at the Hobet 07 operations (transferred to Dal-Tex in August 1996)
- ✓ 1989 Morrison Knudsen began contract mining operations at Cannelton with a Marion 8200 72 CY
- ✓ 1989 AOWV/Ruffner added Marion 8400 49 CY machine
- ✓ 1994 Catenary Coal Company installed a BE 2570 100 CY machine at the Samples Mine (upgraded 1998 to 118 CY)
- ✓ 1998 Evergreen Mining comissioned a BE 1570 75 CY machine in Webster County

History of Draglines Operating in West Virginia

- ✓ 1999 6 draglines in operation:
 - BE 1570 at Hobet 21 Mine
 - Marion 8400 at AOWV/Ruffner Mine
 - Marion 8200 at Dal-Tex Mine
 - BE 2570 at Catenary/Samples Mine
 - Marion 8200 at Cannelton Mine
 - BE 1570 at Evergreen Mine



West Virginia Dragline Operations Arch Coal, Inc.





Mine Planning..



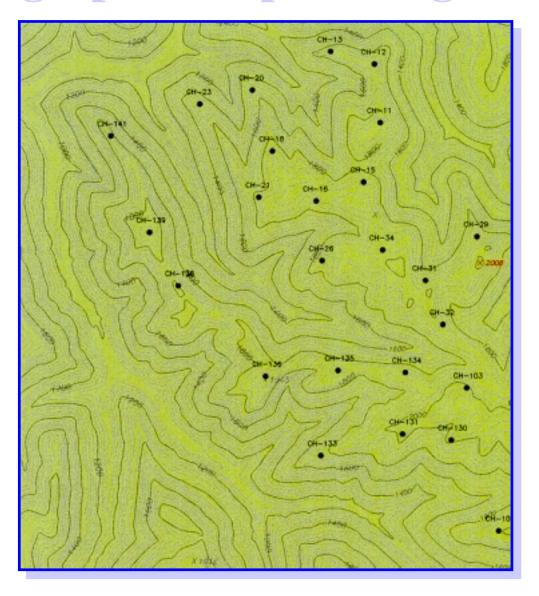


General Considerations in WV

- Topographical constraints
- ✓ Pit geometry (length/width/bench height)
- ✓ Need for added mobility of machine
- ✓ Single vs. multiple seam
- Development requirements
- Contemporaneous reclamation
- ✓ Economics

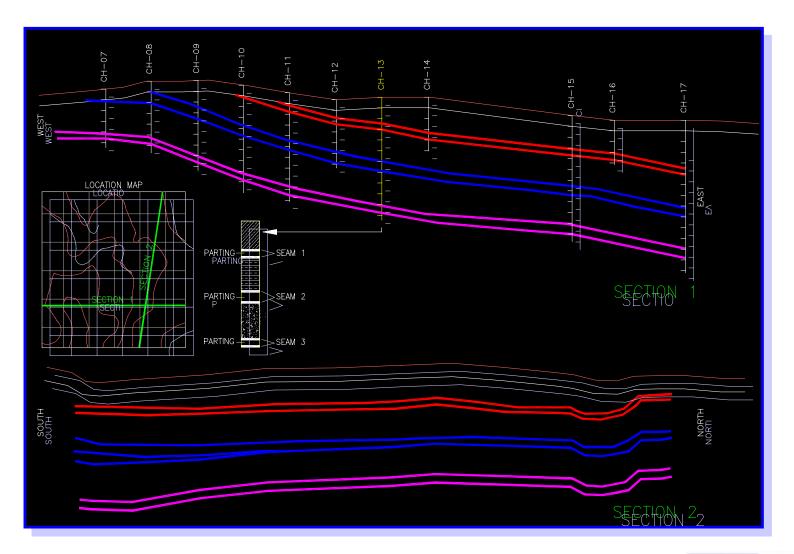


Topographic Map of Dragline Area



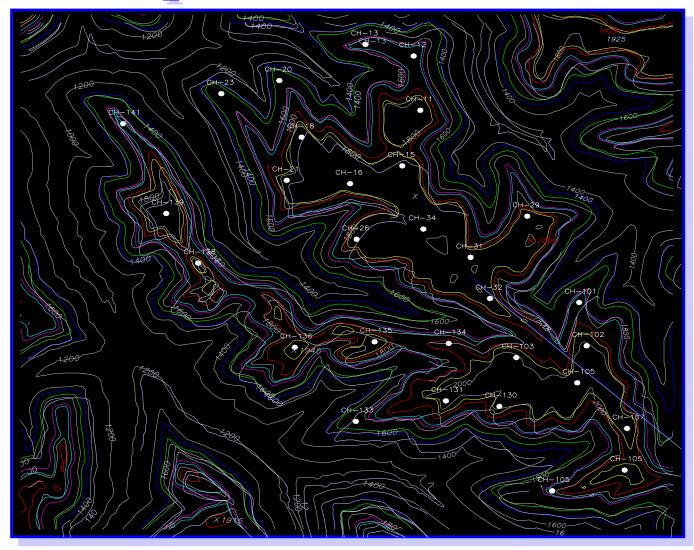


Coal Seam Correlation



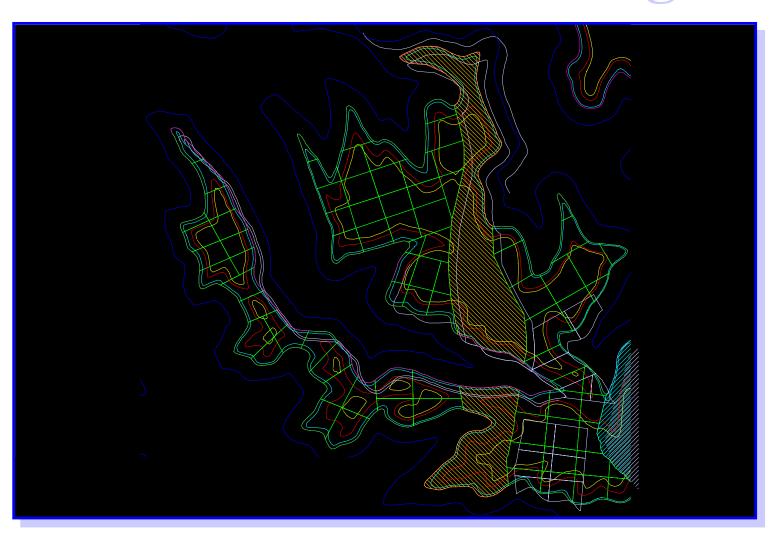


Coal Crops / Reserve Boundaries



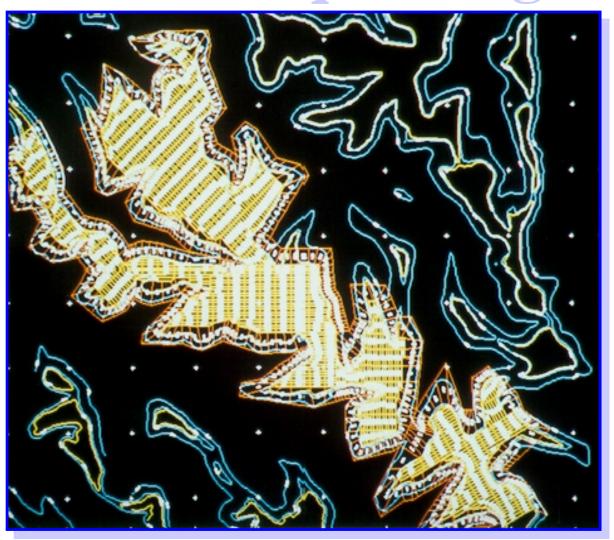


Volumetric Gridding





Mine Sequencing





3-Dimensional Modeling





Pit Geometry



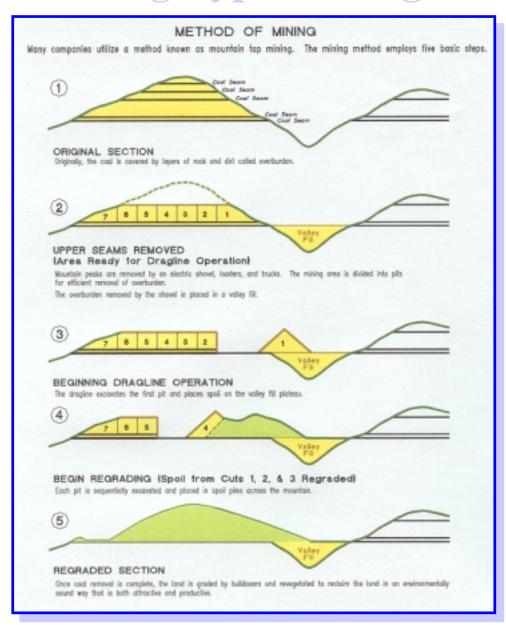


BE 2570 - Samples Mine



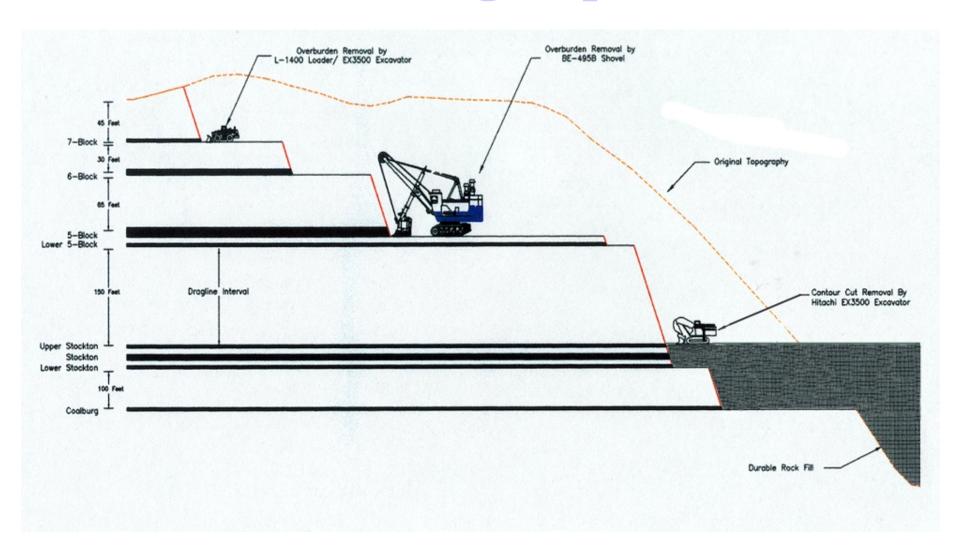


Schematic Showing Typical Dragline Operation



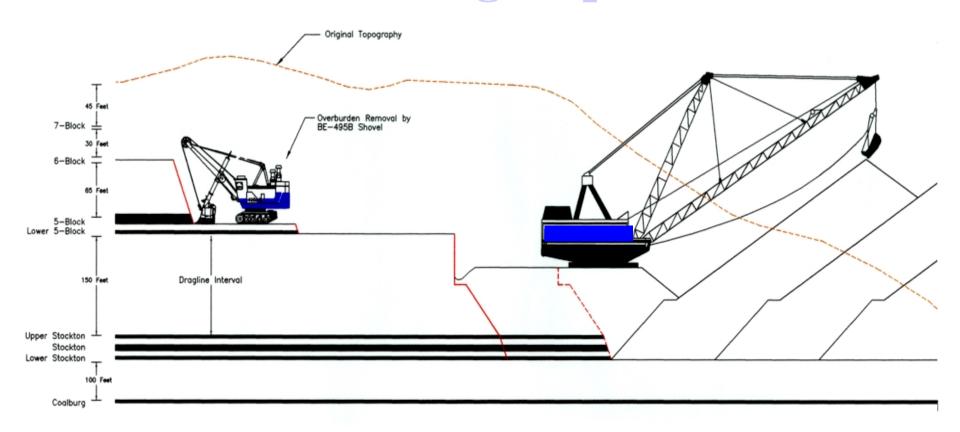


General Mining Sequence 'A'



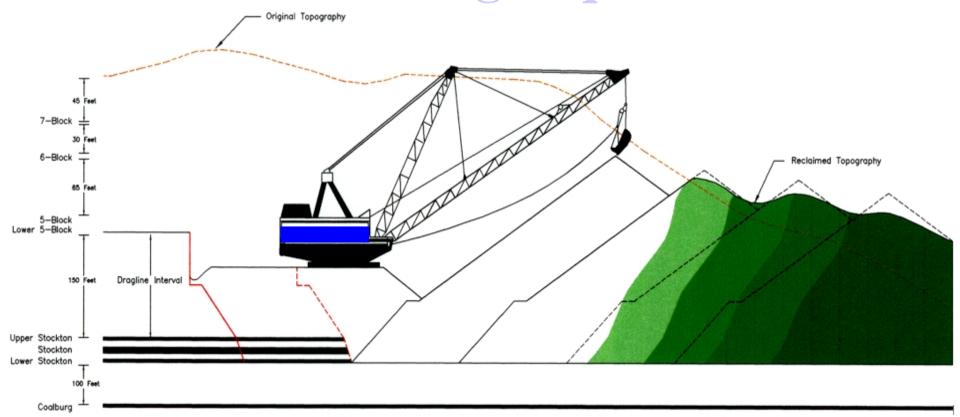


General Mining Sequence 'B'



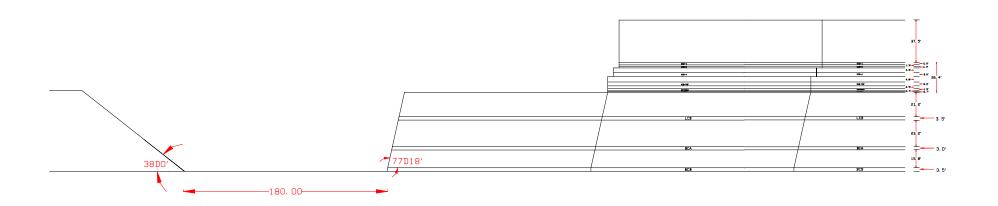


General Mining Sequence 'C'



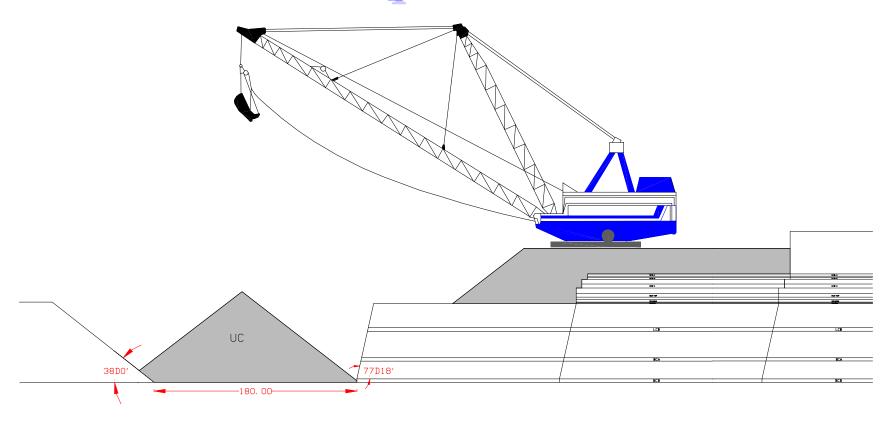


Typical Multi-Seam Dragline Sequence '1'



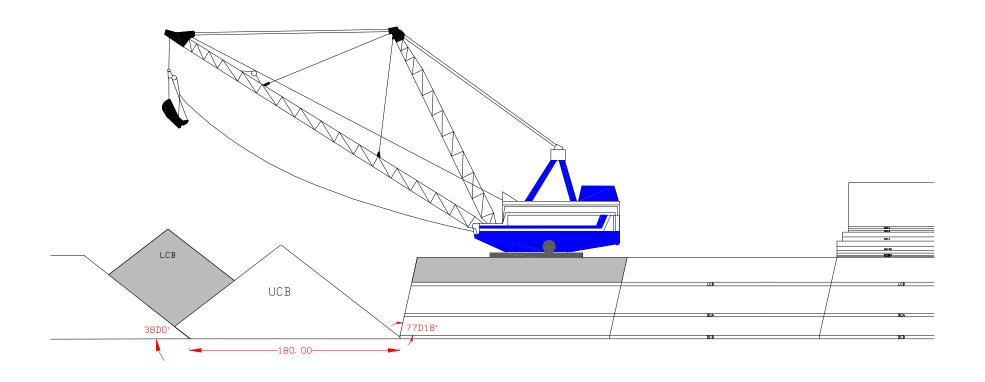


Typical Multi-Seam Dragline Sequence '2'



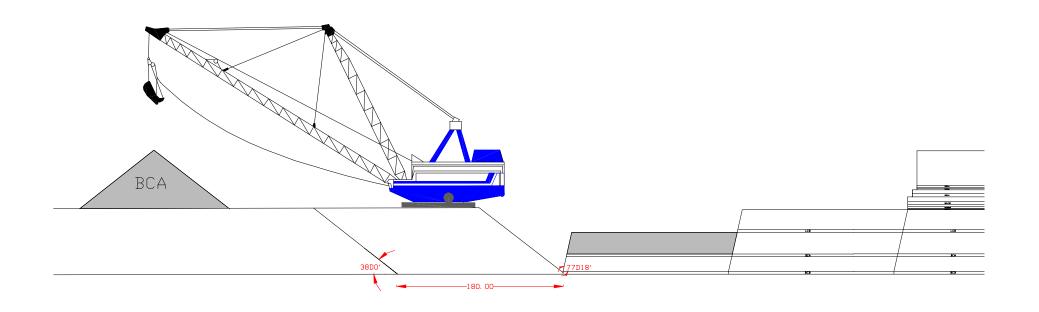


Typical Multi-Seam Dragline Sequence '3'



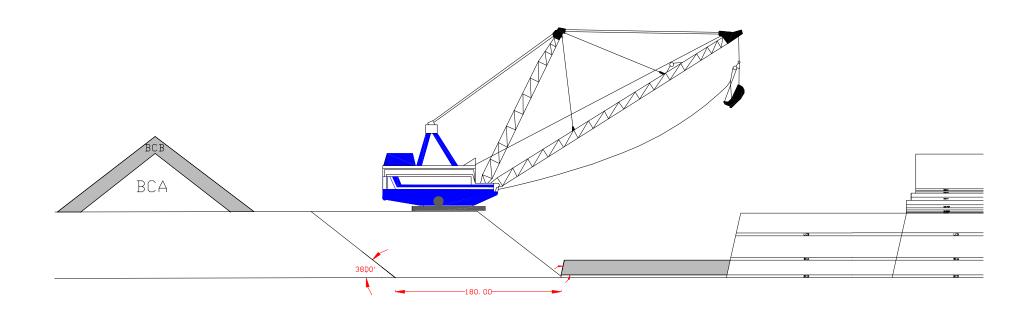


Typical Multi-Seam Dragline Sequence '4'





Typical Multi-Seam Dragline Sequence '5'





During Mining



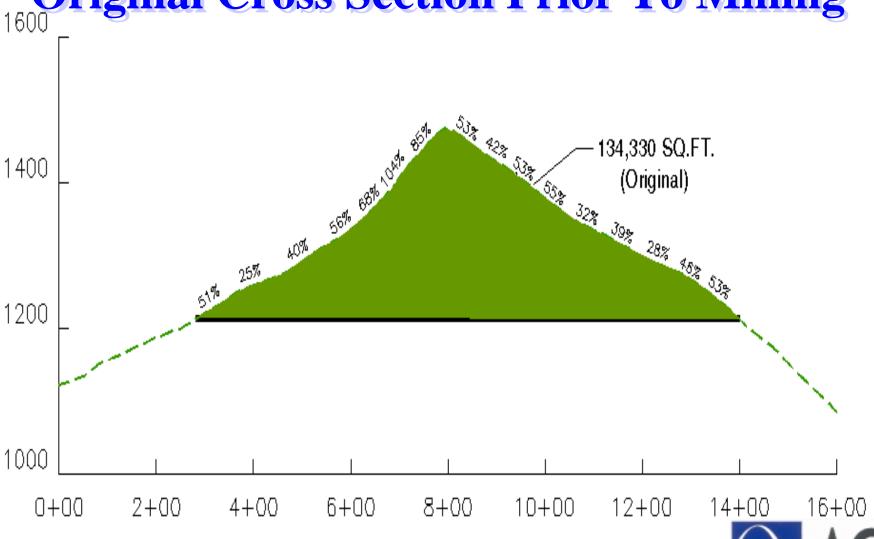


After Mining (1+ yrs. reclamation)

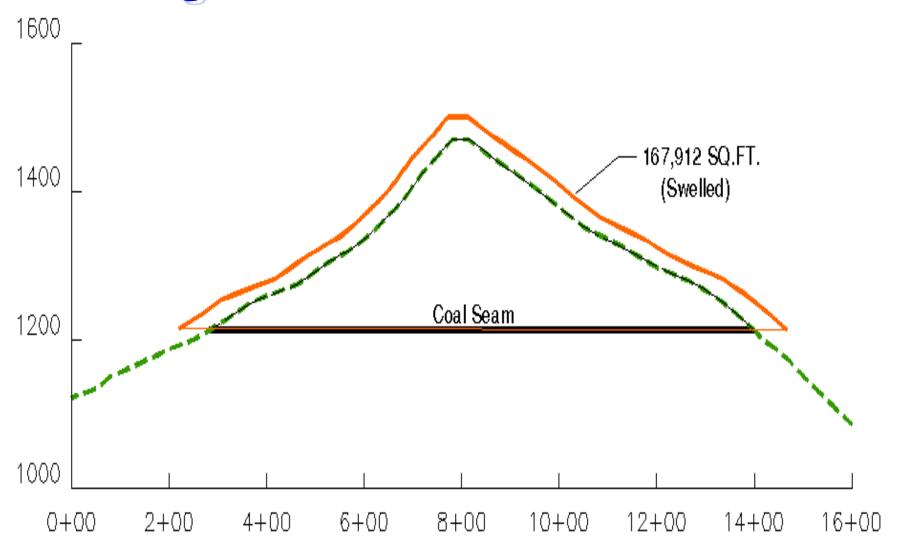




Concept of Excess Spoil Original Cross Section Prior To Mining

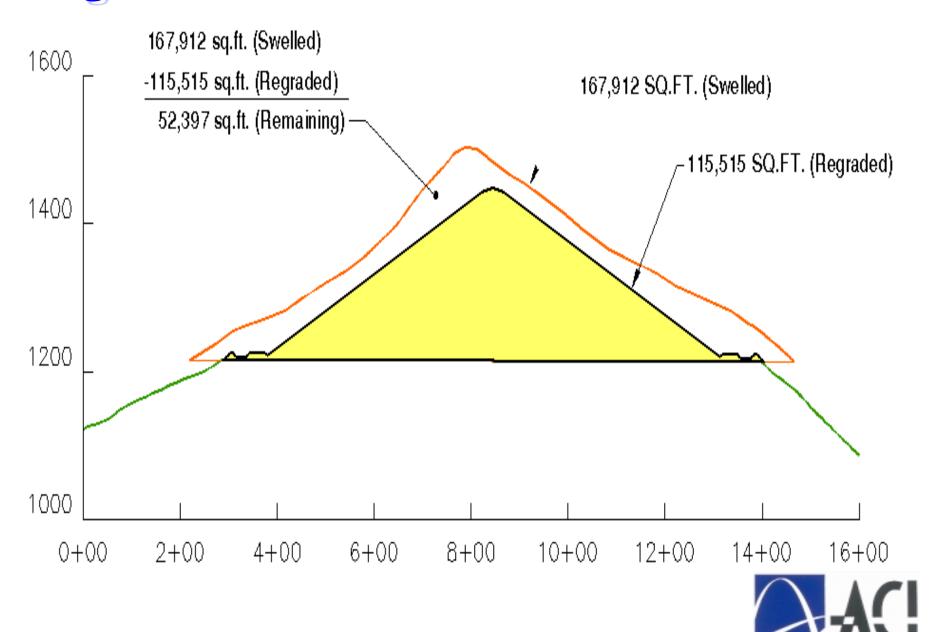


Original Material Swelled 125%





Regraded Cross Section After Reclamation

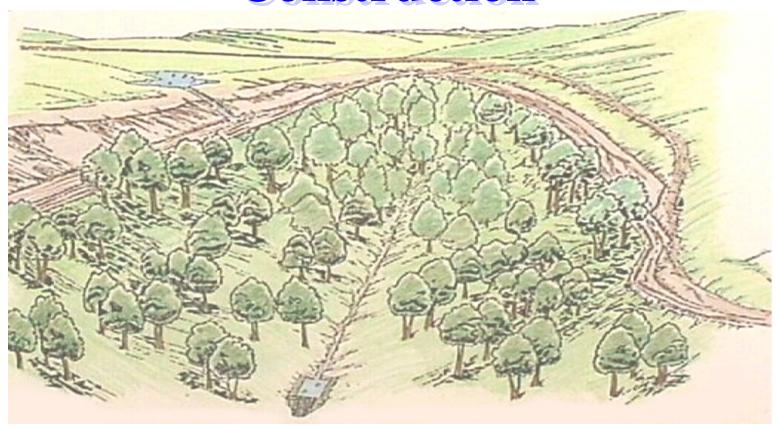


Concept of Excess Spoil Disposal Alternatives

- ✓ Two primary disposal alternatives:
 - 1 Valley Fill (usually durable rock construction)
 - 2 Backfill on mined-out area

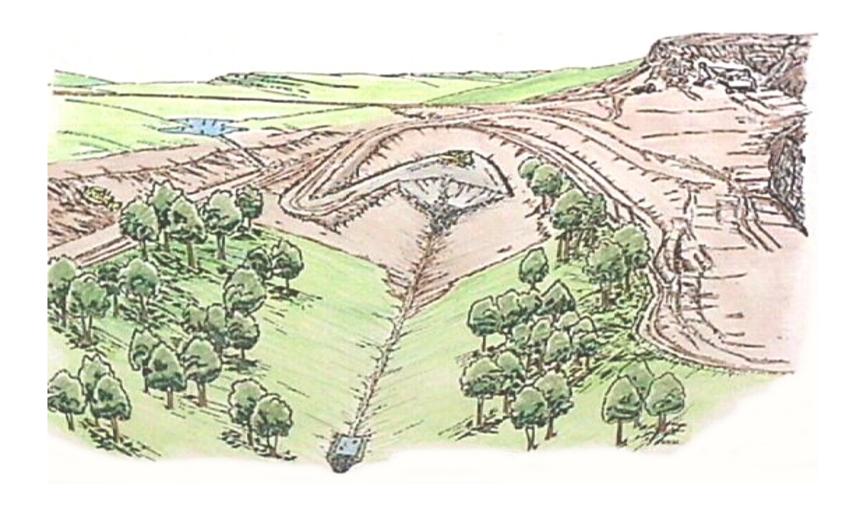


Durable Rock Valley Fill Construction



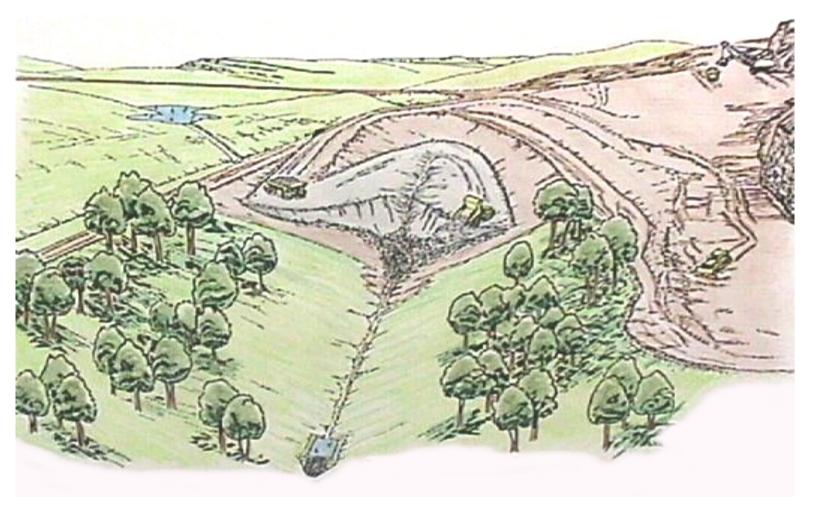
Phase 1 Sediment Pond Construction





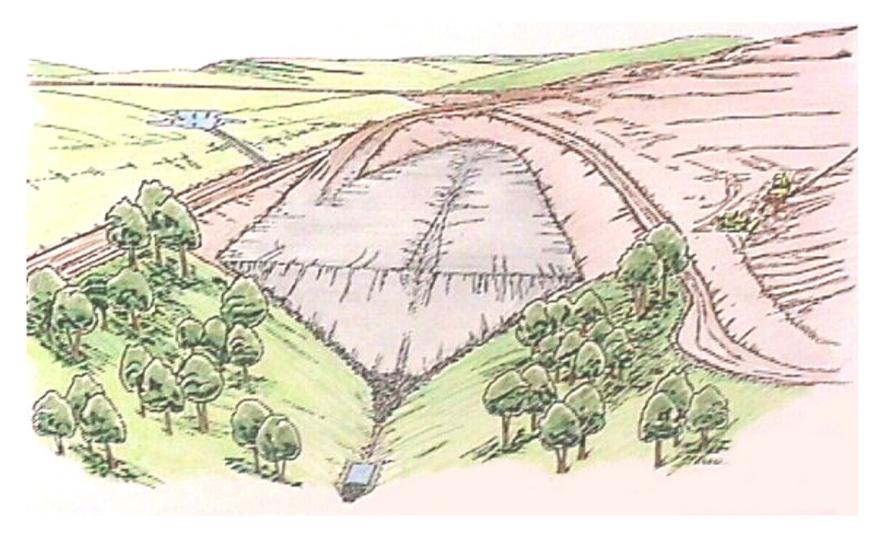
Phase 2
Initial Overburden Placement





Phase 3
Continued Overburden Placement

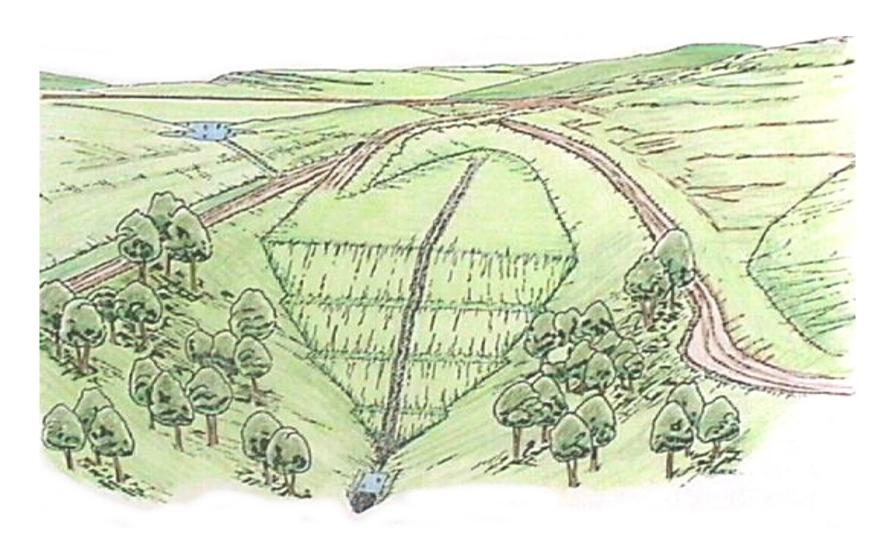




Phase 4

Overburden Placement Completed Surface Drainage Conveyances Constructed





Phase 5
Regrading / Revegetation Completed



















Backfilling Operations





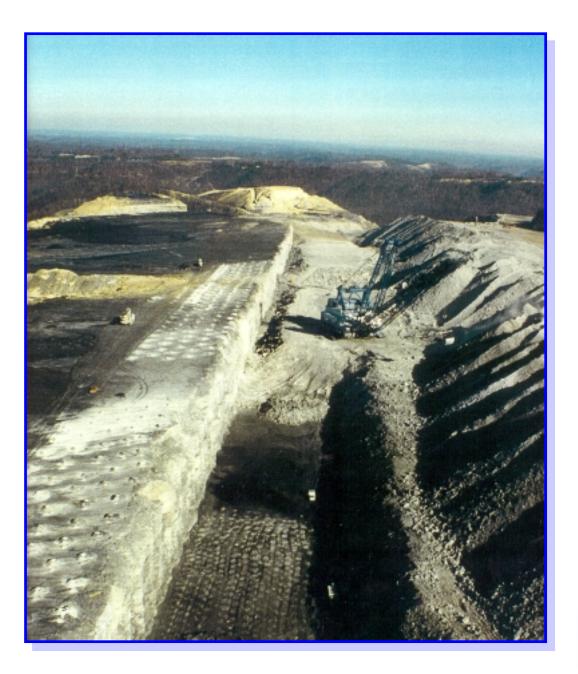
Drilling & Blasting Operations













Coal Loading Operations

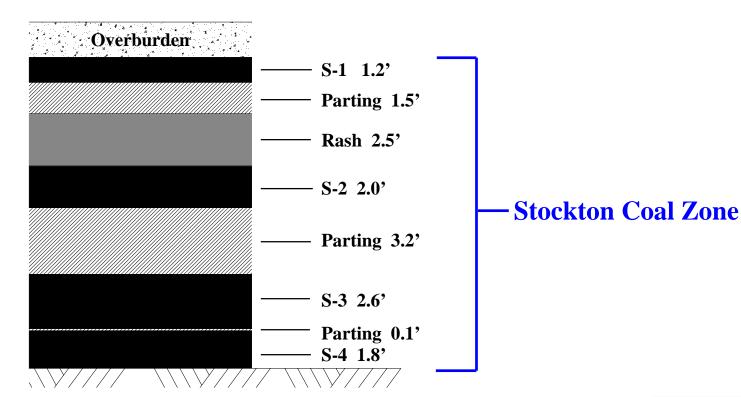




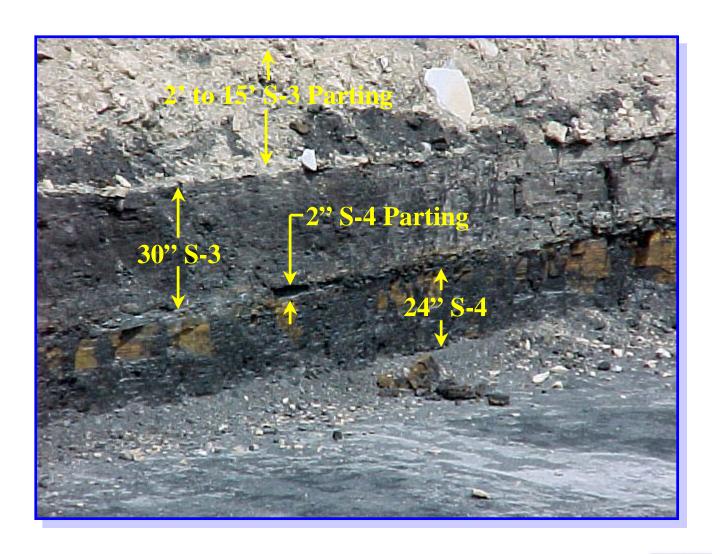




Typical Cross Section Stockton Coal Zone









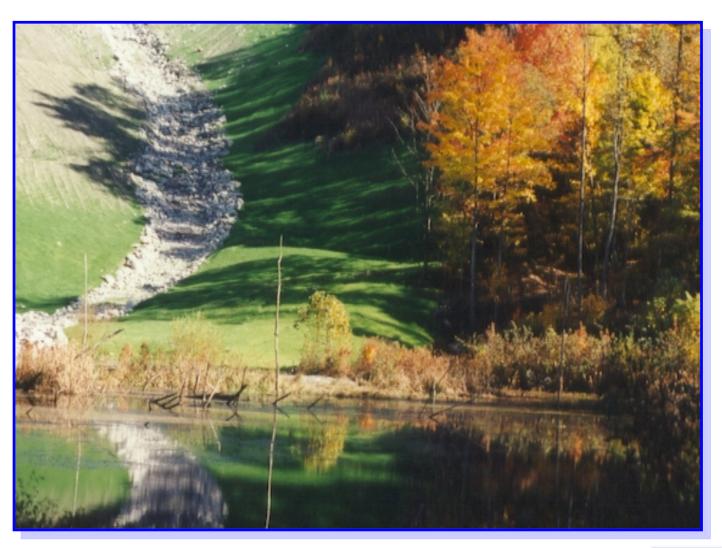
Environmental Considerations



Establishment of Drainage and Sedimentation Controls









Approximate Original Contour





Other...

✓ Waste Management Plan
Ground Water Protection Plan
Spill Prevention Control &
Countermeasure Plan



Fixing the Scars of the Past

• "Third Generation" Surface Mining

- ✓ Restoration of abandoned refuse sites eligible for AML funding at no cost to the state
- **✓** Creation of wetlands and passive water treatment sites
- **✓** Elimination of <u>miles</u> of pre-SMCRA highwalls
- ✓ Extinguishment or isolation of abandoned underground mine fires



Pre-SMCRA Highwalls and Deep Mine Entries









Abandoned Coal Refuse Dumps









Acid Mine Drainage





Reclaimed Pre-law Refuse Sites





Wetlands Construction





Related Benefits

- Resource recovery
- Can address prior environmental problems
- ✔ Provides opportunities for future use of resource due to infrastructure development



Russian Dragline - Circa 1998



